Pollution Prevention and Waste Minimization Green Zia Analysis of the Nuclear Materials Safeguard and Security Upgrades Project Phase I

1.0 Background

The Nuclear Materials Safeguard and Security Upgrade Program (NMSSUP) is responsible for implementing design changes and upgrades to the Safeguards and Security System at Los Alamos National Laboratory. The NMSSUP is a line item construction project to upgrade security systems lab-wide. The upgrades will bring LANL into compliance with DOE Order 5632.IC.

The NMSSUP upgrades will proceed in two distinct phases. The Phase I construction, to be completed in FY 2002, will upgrade safeguard and security control systems and modify the appropriate facilities. The scope of Phase II is still being finalized but will address perimeter security issues

2.0 Scope

This document addresses only the NMSSUP pollution prevention and waste minimization opportunities for the Phase I Title I design, preliminary design phase. Because of the overlap of the phases of the project, the Phase I analysis will be implemented in the Phase II design. The analysis will cover the three activities that constitute the upgrade: site preparation, construction and renovation and operation of the renovated facilities. Life cycle energy and resource conservation will be addressed in the facility operation analysis.

There is a significant caveat to this analysis. It is nearly impossible to estimate the size of the waste streams that will be generated during the actual construction activities until the design is more nearly complete. The preliminary design is currently nearing completion. However, the site preparation planning is considerably further advanced and so reliable projections for the waste streams due to this activity are available.

The analysis will use certain of the Green Zia tools.

- 3.0 Application of "Green Zia" Tools
- 3.1 Tools

The State of New Mexico Environment Department (NMED) uses the Green Zia tools in their Green Zia pollution prevention program. The tools allow a process-based system analysis to be performed for virtually any operation. This structured system facilitates process analysis, problem solving and decision making. The tools provide a framework to allow users to evaluate pollution prevention opportunities on a continuing basis.

In this analysis we will apply the process mapping and prioritization tools.

3.2 Process Diagrams

New facility construction and operation at the Laboratory offers a number of opportunities for pollution prevention and waste minimization. The activities associated with the construction phase can generally be divided into site preparation activities and actual construction, renovation and upgrade activities. For the NMSSUP we will consider these activities as well as initial building operation. The activities can be described in the following three process maps.

3.2.1 Site Preparation

The process map for site preparation is shown in Figure 1.

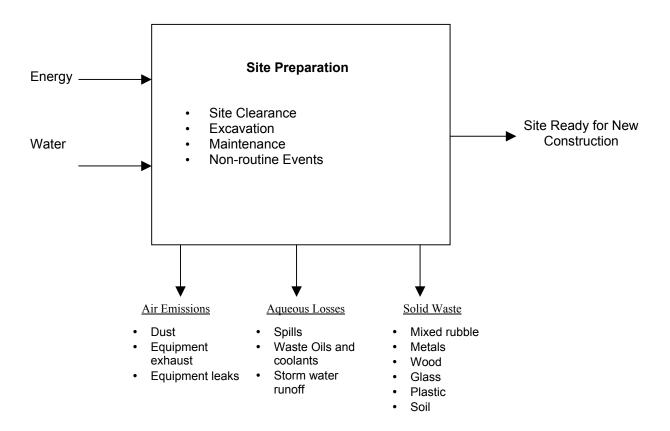


Figure 1 Site Preparation Process

Both energy and water are utilized during the site preparation activities. For the NMSSUP the dominant site preparation activity will be excavation. Waste streams produced by these activities include air emissions of excessive dust and equipment exhaust and leaks, aqueous losses of waste oils and coolants from the equipment, spills and storm water runoff, and solid waste consisting of metals, mixed rubble, wood, glass, plastics, and soil. Aqueous losses associated with spills and losses of oil and coolant are non-routine and can generally be controlled through training and procedures.

For NMSSUP there are three site preparation activities: site preparation for a 3300 sq. ft. addition to TA-55 Building 142, site preparation for a 3,800 sq. ft. addition to TA-3 Building 440 and construction of ~1.5 miles of new ductbank. The facility modification efforts will require some clearing, grubbing and foundation excavation. By far the largest waste stream will be the solid waste generated by excavation for the required new ductbank and manholes.

3.2.2 Facility Construction/ Modification

After site preparation activities are completed, construction of the new facility can begin. Figure 2 shows the anticipated waste streams for construction of a new facility. Inputs to the system include water, energy and building materials. Depending on the type of facility the quantities and types of inputs can vary.

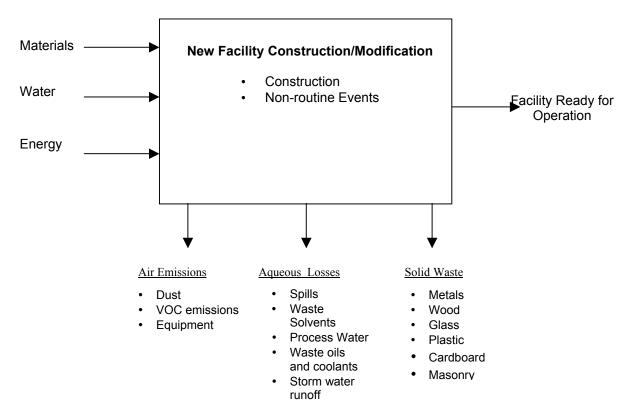


Figure 2 Facility Construction/modification Process

Many of the wastes produced are similar to the site preparation wastes with some variations. Air emissions will not only include fugitive dust emissions and equipment exhaust and leaks, but also the possibility of volatile organic carbon (VOC) emissions from painting operations. Aqueous losses will consist primarily of water used to pressure test piping, waste cleaning solvents, and cleanup waste from masonry tools. Solid wastes generated will include many of the same wastes as the site preparation phase including metals, wood, glass, and plastic from scrap building materials and construction debris. Cardboard waste and excess masonry materials will also be generated during the construction/modification process. Solid wastes will also include paint wastes and some excavation soils. Modifications will generate a fairly large excess electronics waste stream. The magnitude of these waste streams cannot be adequately estimated until the design is more nearly complete.

After the construction of the facility has been completed project management will turn the facility over to the operating group.

3.2.3 New Facility Operation

Activities included in the operation of the facility include facility maintenance and repair, utilities, and janitorial support. Figure 3 shows the anticipated waste streams for the operation of a facility. All facilities will consume both water and energy. Depending on the facility the amount and types of materials consumed will vary.

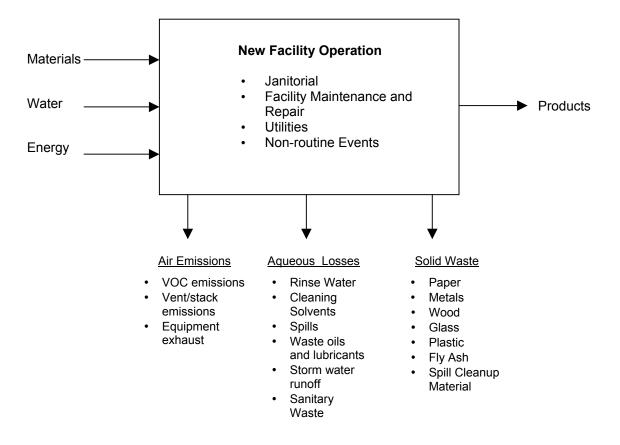


Figure 3 New Facility Operation

The quantities of energy, water and resources used in the operation of the building will depend on the extent to which pollution prevention and waste minimization is integrated into the building design. Buildings can be designed to consume very few resources and thus have low environmental impact as well as lower lifecycle costs for operation. At this juncture the designs are not sufficiently advances to allow an estimate of its operational efficiency and waste stream magnitudes. These waste streams data will be updated when the design is complete.

3.3 Waste Stream Prioritization

At this point in the NMSSUP process, the only waste streams that can be confidently analyzed are the streams generated by site preparation. The types and volumes of waste from the site preparation activities are presented in the following table

Material	Volume (yd. ³)	Significance ¹
Excavated soil	6038	Significant
Rubble asphalt waste	185	Significant
Rubble concrete waste	31	Significant
Misc. Construction Waste	TBD	Insignificant

Significant = quantities large enough or potentially large enough to require regulatory oversight

Table 1 Waste Generated during Site Preparation

In site preparation as in other construction activities there may be unplanned events that lead to waste or pollution, such as, spills, dust generation or stormwater contamination. Planning, training and implementing proper procedures can minimize these non-routine events.

4.0 Pollution Prevention and Waste Minimization Opportunities

The preferred actions to minimize waste during the site preparation phase of NMSSUP are shown in Table 2.

Material	Minimization Action
Excavated soil	Will be stockpiled and used to refill excavations. Excess will be used as clean fill at other projects on LANL property.
Rubble asphalt waste	Asphalt will be ground and reused on site.
Rubble concrete waste	Concrete waste will be crushed and reused.
Misc. Construction Waste	Will be reused or recycled to the extent possible. Normal and acceptable best practices will be used.

Table 2 Waste Minimization Actions for Site Preparation

All soils excavated during NMSSUP Phase I will be replaced in the same area or stockpiled for use at other project sites. Recycling of soil will be done in accordance with applicable NEPA requirements.

Although it is not possible to predict quantities of waste generated during construction in the absence of a detailed design, the following guidelines can be used. When the construction contracts are placed, a detailed assessment of projected waste quantities will be performed and contractors will evaluate and propose mitigation actions (see 5.0 Implementation Plan). The general quidelines include:

- Mitigation control for soil erosion and sedimentation
- Stormwater Pollution Prevention Plan, including inspection and maintenance of stormwater controls, stormwater management following construction and soil stabilization with vegetation.
- Recycle and reuse of shipping boxes, metals, wire ends, etc.
- Spill controls
- Dust suppression

The exact measures along with metrics and quantitative goals will be developed in conjunction with the contractor when the contractor is selected. The measures, metrics and goals will be published in a P2 and Waste Minimization Implementation plan

5.0 Implementation Plan

The detailed implementation plan cannot be produced at this time because of the incomplete design status. However, several steps will be taken that will lead to a detailed Pollution Prevention and Waste Minimization Implementation Plan. These steps are detailed below.

5.1 Contract Language

The request for proposals and contract specifications for the A/E design contractor will require respondents to provide waste generation estimates and a Waste Minimization/Pollution Prevention Plan as part of the bid package. Los Alamos will conduct a review of this report to determine whether the proposed Pollution Prevention and Waste Minimization Plan provides adequate assurance that elimination/minimization of hazardous and pollutant materials and other waste has been properly planned for in all phases of the life cycle.

5.2 Analyze Design Options

A Waste Stream and Resource Consumption analysis will be performed to identify waste streams and resource impacts. The waste streams identified should be eliminated or minimized and energy conservation, water conservation natural resource conservation, ecological protection and regulatory constraints must be considered.

P2 options to accomplish the waste minimization will be defined and investigated. A cost/benefit analysis may be performed to identify the most promising available options and alternatives. The analysis will form the basis for selecting alternatives at each phase of the life cycle.

5.3 Title I Pollution Prevention and Waste Minimization Actions

Title I produces a preliminary design in sufficient detail to fix the project scope. It is the last opportunity to make major design changes. Therefore the following activities must be completed during Title I.

- Anticipated waste streams identified and quantified
- Goals, metrics and performance measures developed
- Develop design criteria that include: energy conservation, materials conservation, solid waste reduction and water conservation
- Develop P2/Waste Minimization priorities
- Develop P2/Waste Minimization integration strategy
- Incorporate P2/Waste Minimization into project schedule
- Conduct design analysis
- Identify and select best P2/Waste Minimization design options.

References:

- 1) Los Alamos National Laboratory Environmental Stewardship Roadmap, LA-UR-00-282, January 7, 2000.
- 2) Nuclear Materials Safeguards and Security Upgrades Project Phase I, Waste Minimization and Pollution Prevention Strategic Plan (DRAFT), Revision 0, August 23, 2000

Acknowledgements

Information in this report was extensively drawn from the second reference and conversations with Leroy Garcia, the NMSSUP ES&H team leader.